Mumps

1. DISEASE REPORTING

A. Purpose of Reporting and Surveillance

1. To assess the burden of mumps in Washington.
2. To identify cases and prevent further spread from cases by recommending appropriate preventive measures, including exclusion.
3. To educate potentially exposed individuals about signs and symptoms of disease, thereby facilitating early diagnosis and reducing the risk of further transmission.
4. To identify and vaccinate susceptible individuals.

B. Legal Reporting Requirements

1. Health care providers: notifiable to local health jurisdiction within 3 work days.
2. Hospitals: notifiable to local health jurisdiction within 3 work days.
3. Laboratories: no requirements for reporting.
4. Local health jurisdictions: notifiable to the Washington State Department of Health (DOH) Communicable Disease Epidemiology Section (CDES) within 7 days of case investigation completion or summary information required within 21 days.

C. Local Health Jurisdiction Investigation Responsibilities

1. Begin routine case investigation within one working day.
2. Facilitate the transport of specimens to assist with the diagnosis of cases.
3. Recommend measures to prevent further spread from the case.
4. Identify and evaluate contacts; educate and recommend measures to prevent further spread from susceptible contacts.
5. Report all *confirmed* and *probable* cases (see Section 3) to CDES. Complete the mumps case report form (http://www.doh.wa.gov/notify/forms/mumps.pdf) and enter the data into the Public Health Issues and Management System (PHIMS).

2. THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Mumps is caused by a single-stranded RNA paramyxovirus.

B. Description of Illness

Prodromal symptoms are nonspecific; they include myalgias, anorexia, malaise, headache, and low-grade fever, and may last 3–4 days. Parotitis (inflammation and swelling of the parotid glands) is the most common manifestation of clinical mumps, affecting 30–40% of infected persons. Parotitis can be unilateral or bilateral; other combinations of single or multiple salivary glands may be affected. Parotitis usually occurs within the first 2 days of symptom onset and may present as an earache or

tenderness on palpation of the angle of the jaw. Symptoms usually decrease within 1 week and generally resolve within 10 days.

Up to 20% of infections are asymptomatic; an additional 40–50% may have only nonspecific or primarily respiratory symptoms.

The most common complication is orchitis, affecting up to 50% of infected males who have reached puberty. While painful, only rarely does this lead to infertility. Other complications are rare, but may include encephalitis, meningitis, oophoritis, mastitis, pancreatitis, myocarditis, arthritis, and nephritis. Spontaneous abortion (miscarriage) can result if an infection occurs during pregnancy, particularly in the first trimester. However, mumps virus is not known to be teratogenic. Rarely (~1 in 20,000), mumps infection can cause deafness, which is usually permanent.

Not all cases of parotitis are caused by mumps virus. Parotitis can also occur as a result of infection with other viruses such as cytomegalovirus, parainfluenza virus types 1 and 3, influenza A, Coxsackie A, echovirus, lymphocytic choriomeningitis virus, and HIV as well as *Staphylococcus aureus*, and other bacteria. Non-infectious caused of parotitis include drugs, tumors, immunologic diseases, and obstruction of the salivary duct.

C. Mumps in Washington State

During 1998–2005, DOH received between 0 and 11 reports of mumps infections per year. A large outbreak of mumps originating in the Midwest in December 2005 spread to nine other states during 2006. Because of increased awareness of mumps during 2006, DOH received over 150 reports of possible mumps, and laboratory testing for mumps - polymerase chain reaction (PCR) and serologic assay - was initiated at DOH Public Health Laboratories (PHL). In October 2006, CDC requested that a strict interpretation of the case definition be used (MMWR 2006;55(42):1152–53) which included reporting any previously immunized person with 2 or more days of parotitis as a probable case. Using these guidelines, 42 reports of confirmed and probable mumps were identified in 2006, though none were linked to the outbreak in the Midwest.

D. Reservoir

Humans are the only known reservoir.

E. Modes of Transmission

Transmission occurs through respiratory droplets or through direct contact with nasopharyngeal secretions.

F. Incubation Period

The incubation period is usually 16–18 days, but can range from 12–25 days after exposure.

G. Period of Communicability

Mumps virus has been found in respiratory secretions as early as 3 days before the start of symptoms and up to 9 days after onset. However, the patient is most infectious within the first 5 days. Therefore, CDC now recommends isolating mumps patients for 5 days following onset of symptoms (parotitis) (MMWR 2008;57 [No.40]:1103–4).

H. Treatment

Treatment is supportive.

I. Immunity

Immunity is generally lifelong and develops after either clinical or inapparent infections. Most adults, particularly those born before 1957, are likely to have been infected naturally and may be considered to be immune, even if they did not have recognized disease. In response to the nationwide mumps outbreak in 2006, ACIP recommendations for prevention and control of mumps were updated. Evidence of immunity through documentation of vaccination is now defined as 1 dose of live mumps vaccine for preschool-aged children and for adults not at high risk for exposure and infection and 2 doses of live mumps vaccine for school-aged children (i.e., grades K–12) and for adults at high risk for exposure and infection (i.e., health-care workers, international travelers, and students at post-high-school education institutions) (MMWR 2006;55(22):629–30).

3. CASE AND CONTACT DEFINITIONS

A. Case Definition (2008)

1. Clinical Case Definition

   An illness with acute onset of unilateral or bilateral tender, self-limited swelling of the parotid and/or other salivary gland(s), lasting at least 2 days, and without other apparent cause.

2. Clinically Compatible Illness

   Infection with mumps virus may present as aseptic meningitis, encephalitis, hearing loss, orchitis, oophoritis, parotitis, other salivary gland swelling, mastitis, or pancreatitis.

3. Laboratory Criteria

   a. Isolation of mumps virus from clinical specimen, or

   b. Detection of mumps nucleic acid (e.g., standard or real time RT-PCR assays), or

   c. Detection of mumps IgM antibody, or

   d. Demonstration of specific mumps antibody response in absence of recent vaccination, either a four-fold increase in IgG titer as measured by quantitative assays, or a seroconversion from negative to positive using a standard serologic assay of paired acute and convalescent serum specimens.

4. Case Definition

   a. Suspected: A case with clinically compatible illness or that meets the clinical case definition without laboratory testing, or a case with laboratory tests suggestive of mumps without clinical information.

   b. Probable: A case that meets the clinical case definition without laboratory confirmation and is epidemiologically linked to a clinically compatible case.

   c. Confirmed: A case that 1) meets the clinical case definition or has clinically compatible illness, and 2) is either laboratory confirmed or is epidemiologically linked to a confirmed case.

5. Comment

   With previous contact with mumps virus either through vaccination (particularly with 2 doses) or natural infection, serum mumps IgM test results may be negative; IgG test results may be positive at initial blood draw and viral detection in RT-PCR or culture may have low yield. Therefore, mumps cases should not be ruled out by negative laboratory results. Serologic tests should be interpreted with caution, as false positive and false negative results are possible with IgM tests.

B. Close Contacts (of a person with mumps)

Mumps spreads by direct contact with infectious respiratory secretions by droplet transmission. Such droplets generally travel 3 feet or less when an infected person talks, coughs, or sneezes. The risk of transmission of mumps is a function of multiple factors including clinical features of the source case as they relate to communicability (e.g., stage of illness, character of cough), proximity and duration of contact, ventilation, and use of appropriate infection control measures (mask, eye protection).

Consult with a CDES epidemiologist as needed on a case-by-case basis regarding determinations of close-contacts. Examples of close contact with mumps patients include:

1. Direct face-to-face contact with a symptomatic case-patient during the contagious period. This includes household and immediate family members, boyfriends/girlfriends, and child care contacts (those who spend many hours together or sleep under the same roof).
2. An obvious exposure that involves direct contact with respiratory, oral, or nasal secretions from a case-patient during the contagious period (e.g., a cough or sneeze in the face, sharing eating utensils, sharing water bottles, kissing, mouth-to-mouth resuscitation, or performing intubation or nasotracheal suctioning without a mask).
3. Close proximity for a prolonged period of time with a case-patient during the contagious period. Risk of droplet exposure increases with longer duration and closer proximity of contact.

   Examples of persons who may be at increased risk include:

   a. non-household close friends or other social contacts
   b. some passengers during shared transportation
   c. some contacts at community activities or at the place of employment
   d. some healthcare workers caring for a case without wearing a mask
   e. children attending an after-school care group or play group on the same days

   Note: Close contact does not include activities such as walking by a person or briefly sitting across a waiting room or office.

4. DIAGNOSIS AND LABORATORY SERVICES

A. Diagnosis

Mumps is most commonly diagnosed by detection of mumps specific IgM antibody in serum, or by isolation of mumps virus or detection of mumps nucleic acid by PCR assay on secretions collected from the buccal mucosa.

1. Viral culture and detection of mumps nucleic acid by PCR assay: Viral culture and detection of mumps nucleic acid by PCR are not highly sensitive tests. Mumps virus is isolated in up to 85% of buccal specimens when specimens are collected within 5 days after onset of symptoms. The yield is highest from buccal specimens collected within 2 days of onset. Therefore, a negative culture and/or PCR assay cannot rule out the diagnosis of mumps.
2. Serologic testing: A serum sample for both IgM and IgG should be collected at the first clinical encounter, if possible. In unvaccinated cases, IgM is present by day 5 post onset of symptoms and peaks at about 1 week; IgM can be present for at least 6 weeks. Therefore, among **unvaccinated** persons, if an acute IgM is collected less than 5 days after onset of parotitis and the IgM is negative, mumps cannot be ruled out and a second serum sample (collected 5–7 days after onset) is recommended.

   Recent evidence suggests that persons previously exposed to the virus through either vaccination or disease may still become infected. Elevation of mumps IgM may be transient or absent in these individuals. Experience suggests that IgM assays from persons with acute infection may be negative in up to 50% of previously immunized individuals (i.e., a negative IgM does not rule out infection in a vaccinated person) (MMWR 2006;55(42):1152-3). In contrast, IgG levels in previously vaccinated individuals may rise rapidly after exposure or infection. By the time an "acute" sample is collected, IgG levels may already be quite high, precluding the possibility of detecting a 4-fold rise in a convalescent specimen.

   For additional information regarding laboratory testing for mumps infection, see: http://www.cdc.gov/vaccines/vpd-vac/mumps/outbreak/faqs-lab-test-infect.htm

B. Tests Available at the Washington State Department of Health Public Health Laboratories (PHL)

PHL will perform viral cultures and real time PCR for mumps virus on buccal swabs from persons suspected to have mumps (urine testing is no longer recommended). Ideally, buccal swabs should be collected within 3 days of onset of parotitis, and are not useful if collected 5 or more days after parotitis begins.

Healthcare providers can be encouraged to send serum to commercial laboratories for both mumps specific IgM and IgG testing. There is a problem with false positive IgM results with any of the commercially available tests for mumps specific IgM. If a positive IgM is reported by a commercial laboratory, the local jurisdiction should make arrangements for the specimen to be sent to PHL for additional testing. PHL currently has a mumps EIA serology test and is also working closely with CDC to assure accurate results for each suspect mumps case.

All requests for mumps testing sent to PHL must have approval from the local health jurisdiction, who will get approval from a CDES epidemiologist (877-539-4344).

C. Specimen Collection

1. Buccal swab specimen for culture and PCR: Massage the parotid gland for about 30 seconds prior to collecting specimen. Place a Dacron® swab between rear molars and cheek and leave in place 10–15 seconds. Place swab in viral transport medium (VTM). Ensure that the cap is securely tight and will not leak. Keep cold after collection and during shipment.
2. Serum specimen: Collect blood in a red-gray top (SST) or red top tube, at least 4 ml blood, or send at least 2 ml serum. The serum should be kept cold after collection and during shipment. The test request form should include the date of symptom onset, since this information is essential for interpretation of serologic results.

D. Specimen Shipping

All specimens must be accompanied by a PHL "Virus Examination" lab form, with patient name, submitter name, date of collection, date of onset of symptoms, and symptoms. The PHL lab form may be obtained online at http://www.doh.wa.gov/EHSPHL/PHL/Forms/SerVirHIV.pdf.

Ship the specimen(s) so that they are kept appropriately cool (not frozen) for the type of delivery (regular or overnight) selected.

5. ROUTINE CASE INVESTIGATION

Interview the case and others who might be able to provide pertinent information.

A. Evaluate the Diagnosis

Review the clinical presentation and laboratory test results. Since parotitis can be caused by many other conditions, facilitate the transport of specimens to PHL to confirm the diagnosis as needed. Proceed with a public health investigation for all *probable* and *confirmed* cases (see Section 3).

B. Identify Source of Infection

Attempt to determine if a suspected case was in contact with a known case or had recently traveled to an area where mumps transmission is being reported.

C. Identify Exposed, Susceptible Close Contacts

Identify persons who had close contact (see Section 3C) with the case during the communicable period (3 days prior to and 5 days after the onset of parotitis). Determine whether contacts can be considered immune or should be considered susceptible to mumps infection. Acceptable presumptive evidence of immunity to mumps includes one of the following:

- Documentation of adequate vaccination*,
- Laboratory evidence of immunity,
- Birth before 1957, or

- Documentation of physician-diagnosed mumps.

*Evidence of immunity through documentation of adequate vaccination is now defined as 1 dose of a live mumps virus vaccine for preschool-aged children and adults not at high risk and 2 doses for school-aged children (i.e., grades K–12) and for adults at high risk (i.e., persons who work in health care facilities, international travelers, and students at post-high school educational institutions) (MMWR 2006;55(22):629–30).

Documentation of immunization is preferable, but serologic testing for IgG can be performed in exposed contacts who do not have proof of immunity.

The following are considered evidence of immunity for healthcare workers:

In non-outbreak settings:

- Documented physician-diagnosed mumps,
- Serologic evidence of immunity, or
- Documented receipt of 1 dose of mumps if born before 1957, or 2 doses of mumps vaccine if born during or after 1957.

During an outbreak, more stringent requirements for evidence of immunity should be used:

- Documented physician-diagnosed mumps,
- Serologic evidence of immunity, or
- Documented receipt of 2 doses of mumps vaccine regardless of birth year.

D. Environmental Evaluation

None

6. CONTROLLING FURTHER SPREAD

A. Infection Control Recommendations

1. Hospitalized patients should be cared for using droplet precautions for 5 days after the onset of parotitis (MMWR 2008;57 [No.40]:1103–4).
2. Cases should stay home and not go to school, work, public places or social activities for 5 days after the onset of parotitis. Family members who are not immune should avoid contact during the time the case is infectious. Healthcare workers with mumps illness should be excluded from work until 5 days after the onset of parotitis.
3. Cases should be taught "respiratory etiquette" (see section 8B).

B. Case Management

No further public health actions are required after the above infection control measures have been implemented

C. Contact Management

1. Symptomatic Contacts

All close contacts with symptoms compatible with mumps should be referred to a

healthcare provider for assessment and laboratory testing; the healthcare provider should be made aware of the specific reason for referral.

2. Exclusion

All symptomatic close contacts should be excluded from school, workplace and child care until they have been evaluated for possible mumps. Susceptible asymptomatic contacts should be excluded from school, workplace, and child care from the 12th day after the first exposure through the 25th day after the last exposure.

Schools:

In the setting of a mumps outbreak in a school, pupils who are exempted from immunization for any reason should be excluded from the 12th day after the first exposure through the 25th day after the last known exposure. Excluded students who choose to be vaccinated can be readmitted immediately after immunization.

Healthcare workers exposed to a person with mumps:

Exposed healthcare personnel who do not have acceptable evidence of immunity should be excluded from the 12th day after the first unprotected exposure to mumps through the 26th day after the last exposure. The mumps vaccine cannot be used to prevent the development of mumps after exposure. Hence, previously unvaccinated healthcare personnel who receive a 1st dose of vaccine after an exposure are considered non-immune and must be excluded as described above. *Note:* The duration of exclusion from healthcare settings is longer than that in other settings.

Exposed healthcare personnel who had been previously vaccinated for mumps, but received only one dose of mumps vaccine may continue working following an unprotected exposure to mumps. Such workers should receive a 2nd dose as soon as possible, but no sooner than 28 days after the first. They should be educated about symptoms of mumps, including non-specific presentations, and should notify occupational health if they develop these symptoms.

Exposed healthcare personnel who are immune do not need to be excluded from work following an unprotected exposure. However, because 1 dose of MMR vaccine is about 80% effective in preventing mumps and 2 doses is about 90% effective, some vaccinated personnel may remain at risk for infection. Therefore, healthcare workers should be educated about symptoms of mumps, including non-specific presentations, and should stay away from the work environment and notify occupational health if they develop these symptoms.

3. Immunization

Mumps vaccine has not been shown to be effective in preventing disease after exposure. However, vaccination of susceptible contacts will protect against disease from future exposures. If susceptible contacts are vaccinated after exposure, the exclusions mentioned above still apply. Individuals who have had documented mumps disease do not need to receive the mumps vaccine. Immune globulin (Ig) and mumps immune globulin are not recommended after exposure.

Preschool children (ages 1–4) and adults not at high risk should receive 1 dose of mumps vaccine in the form of MMR (measles, mumps, rubella) vaccine; for children in grades

K–12 and adults at high risk (i.e., persons who work in healthcare facilities, international travelers, and students in post-high school educational institutions), 2 doses of MMR are recommended.

In outbreak situations, a second dose of mumps vaccine should be considered for children aged 1–4 years and adults at low risk who have received 1 dose depending on the epidemiology of the outbreak (e.g., the age groups and/or institutions involved) (MMWR 2006;55(22):629–30). The second dose can be administered no sooner than 28 days after the first dose. See section 8A for contraindications to vaccination.

4. Education

All close contacts regardless of immunity status should be educated on the signs/symptoms of mumps and told to watch for these signs/symptoms from the 12th day after the first exposure through the 25th days after the last exposure. If symptoms develop in these contacts, they should have an understanding that respiratory etiquette (see Section 8B) must be followed and medical care should be sought promptly; remember, providers must be made aware of the mumps exposure in order to appropriately evaluate the patient for mumps and limit risk to others in the office.

D. Environmental Measures

None

7. MANAGING SPECIAL SITUATIONS

A. Mumps in Healthcare Settings

For additional information regarding Prevention and Control of Mumps in Healthcare Settings, see: http://www.cdc.gov/vaccines/vpd-vac/mumps/outbreak/control-hcw.htm.

8. ROUTINE PREVENTION

A. Immunization Recommendations

A live attenuated mumps virus vaccine (Jeryl Lynn strain) was introduced in the United States in 1967 and is available either as a single vaccine or in combination with rubella and measles live virus vaccines (MMR). Routine immunization with MMR is recommended during childhood; the first dose of MMR is recommended at 12–15 months of age with a second dose recommended at 4–6 years. Two doses of MMR vaccine are also recommended for students attending college and other post-high school institutions. Although about 95% of susceptible persons develop antibodies after a single dose of vaccine, only about 80% can be considered protected. After two doses of vaccine, 90% of persons are considered protected.

Contraindications to vaccine include a severe allergic reaction (e.g., anaphylactic allergy) to neomycin, gelatin or a previous dose of MMWR vaccine; pregnancy; and immunodeficiency or immunosuppression. Persons with moderate or severe acute illness should not be vaccinated until the illness has resolved. Receipt of antibody-containing blood products (e.g., immune globulin, whole blood, or packed red blood cells) may interfere with seroconversion following mumps vaccination. Vaccine should be given 2 weeks before, or deferred for at least 3 months following, administration of an antibody-containing blood product.

For more information about MMR vaccine schedules, adverse reactions and contraindications, please see the most recent Red Book.

B. Prevention Recommendations

In addition to immunization, persons should practice "respiratory etiquette" or good health manners to stop the spread of respiratory pathogens.

Persons can keep respiratory pathogens to themselves by:

- Covering the nose and mouth with a tissue when sneezing, coughing or blowing the nose.
- Throwing out used tissues in the trash as soon as possible.
- Always washing hands after sneezing, blowing the nose, or coughing, or after touching used tissues or handkerchiefs.
- Washing hands often when sick.
- Using warm water and soap or alcohol-based hand sanitizers to wash hands.
- Staying home if coughing and febrile.
- Seeing a doctor as soon as possible if coughing and febrile, and following their instructions, including taking medicine as prescribed and getting lots of rest.
- If requested, using face masks provided in doctors' offices or clinic waiting rooms.

Persons can keep pathogens away by:

- Washing hands before eating, or touching eyes, nose or mouth.
- Washing hands after touching anyone else who is sneezing, coughing, blowing their nose, or whose nose is running.
- Not sharing things like cigarettes, towels, lipstick, toys, or anything else that might be contaminated with respiratory germs.
- Not sharing food, utensils or beverage containers with others.

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UPDATES

December 2007 Revisions

Section 3B: Revisions were made to the examples of close contact.

March 2008 Revisions

Section 3A: The case definition was updated.

October 2008 Revisions

Section 2G: A reference was added for the period of communicability.

Section 4A: Information was added regarding laboratory testing.

Section 6A: The recommendation for the duration of isolation for persons with mumps in

health care settings was updated (MMWR 2008;57 [No.40]:1103–4).
Section 6C: The recommendation for the duration of exclusion for exposed, non-immune health care providers was updated (MMWR 2008;57 [No.40]:1103–4).